

Detection of pneumothorax by accident and emergency officers and radiologists on single chest films

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SUMMARY

To assess whether an accurate diagnosis of pneumothorax can be made on a single chest film, 233 pairs of inspiratory (I) and expiratory (E) chest films taken in an accident and emergency (A&E) department for suspected pneumothorax were reviewed by two A&E officers and three radiologists. The films were assessed for the presence of pneumothorax by viewing the I film in isolation and, after an interval, by viewing the paired I and E films together. Fifty-four of the patients had a pneumothorax. The five observers missed 23 pneumothoraces (8.5% of total) on the I film alone which were correctly diagnosed on the paired I and E films, the three radiologists missed 10/162 pneumothoraces on the I film alone which were correctly identified on the I and E films (6%) and the two A&E officers 13/108 (12.5%). The use of a single inspiratory chest film for suspected pneumothorax could result in pneumothoraces being missed, particularly by less experienced observers and therefore we believe that paired I and E films should continue to be used routinely for suspected pneumothorax.

INTRODUCTION

Paired I and E chest films are taken in many hospitals as the standard investigation for suspected pneumothorax. An I film allows the best assessment of the lungs and the bony thorax. The E film is believed to make a pneumothorax more obvious. In an E film the volume of air in the pleural cavity is relatively greater in relation to

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the volume of the lung (Green *et al.*, 1977) and the volume of air in the lung is reduced which makes the lung more dense and the lung edge more obvious, (Blank, 1989).

Bradley *et al.* (1991), after a study by two radiologists, suggested that E films should not be performed routinely in the diagnosis of pneumothorax. By routinely taking only I films the cost of the investigation and radiation dose to the patient would be reduced.

Clinical decisions in the A&E department are often based on X-ray film interpretation by junior A&E officers. To our knowledge there has been no previous study to compare the detection rate of pneumothorax on I films alone against the detection rate on paired I and E films by observers with different levels of experience.

METHODS

Two hundred and thirty-three pairs of I and E chest radiographs taken at our hospital between January 1988 and September 1991 were reviewed. The original examinations had all been performed in the A&E department for suspected pneumothorax. Patients were aged 17–81 years (mean age 39 years) and 161 (69%) were male. Fifty-four patients had a pneumothorax.

Each inspiratory films was assessed in isolation by five independent observers for the presence of a pneumothorax. After an interval of at least 8 weeks the inspiratory and expiratory films were assessed together. Films were viewed in batches of 25 single films or 25 pairs of I and E films. If a pneumothorax was considered present the side and size were recorded. The size was assessed subjectively as small, medium or large (Blank, 1989).

The observers were two A&E senior house officers, two radiology registrars and one radiology consultant.

The 54 patients with pneumothorax were aged between 17 and 63 years (mean age 34 years), 41 were male (76%). There were 30 left-sided pneumothoraces and 24 right-sided pneumothoraces (no statistically significant difference).

Differences of opinion were resolved by consensus.

RESULTS

Of the total 270 instances where a pneumothorax should have been identified by the five observers (54 pneumothoraces \times 5), 23 (8.5%) were missed on the I film but correctly identified on the paired I and E films. The three radiologists missed 10/162 pneumothoraces (6%) on I film alone but not on I and E film and the two A&E officers missed 13/108 pneumothoraces (12.5%) on I alone but not on I and E film.

A total of 16/108 pneumothoraces were missed by the two A&E officers on both I and I and E films (14.8%) and 4/162 pneumothoraces were missed on both I and I and E films by the three radiologists (2.4%).

Each of the five observers made fewer errors using paired I and E films than using I films alone. In total there were 34 comparisons between I film alone and I and E film assessments where an individual's assessment based on I film alone differed from their assessment using I and E films. In 29 of these 34 instances (85%) it was the I and E assessment which was correct.

Clearly, and not unexpectedly the performance of the radiologists was superior to that of the A&E officers. There were 139 instances where an A&E officer's assessment differed from a radiologist's assessment, and in 131 of these 139 instances (94%) it was the radiologist who was correct.

There were two patients with pneumothorax which were both missed on the I film alone by all five observers but detected by two radiologists on the paired I and E films.

All of the pneumothoraces which were missed were graded small by the other observers.

On review of the films considered false positive, four showed a prominent apical pleural cap (soft tissue band at lung apex). Rather surprisingly no-one mistook several large bullae for pneumothoraces.

DISCUSSION

The detection of a pneumothorax will usually alter patient management and it is important the diagnosis is made. In this study the pneumothorax detection rate increased by 8.5% overall by using paired I and E films compared with I films alone and for less experienced observers (A&E officers) the pneumothorax detection rate increased by 12.5%. We believe that it would be unwise to perform I films routinely for suspected pneumothorax only, particularly if the assessment is made by relatively inexperienced staff because of the number of pneumothoraces which could be missed.

CONCLUSION

Routine I and E chest films should continue to be performed in the A&E department for suspected pneumothorax.

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